THREE PARTIES PARTNERSHIP BETWEEN BMKG, GOVERNMENT INSTITUTION AND GENERAL PUBLIC ON MANAGEMENT OF RAINFALL OBSERVATIONS NETWORKS IN SOUTH SULAWESI

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Abstract

Proper rainfall observation is required to obtain the right and accurate weather information. At present the observation of rainfall in Indonesia is managed by various parties and coordinated by the Meteorology, Climatology and Geophysics Agency (BMKG). BMKG has rainfall observation networks that spread throughout Indonesia. But, in terms of quantity and distribution, the current rainfall observation network is not ideal yet. It is necessary to increase the density of the observation network. To increase the density of rainfall collection networks, BMKG needs to establish partnerships with all parties including government agencies and the general public. This study attempts to solve the ideal partnership model for rainfall management in Indonesia, especially in South Sulawesi. Three partnership variables, namely motivation, consistency and sustainability, and two determinant variables, namely coaching and incentives used in this study. From the results of the data analysis it was found that the ideal partnership model was joint operations and added with an intensive coaching element to the observers.

Keywords: Observation, Rainfall, Partnership.

INTRODUCTION

Weather and climate are natural phenomena that have a huge influence on human life in various sectors, such as health, agriculture and plantations, infrastructure, recreation, transportation, energy, water management, and others (Friedrich, 2018; Herrnstadt & Muehlegger, 2014; Moazami, Nik, Carlucci, & Geving, 2019; Ray, Hughes, Konisky, & Kaylor, 2017; Shannon & Motha, 2015). Weather information, both in the form of analysis and forecasting, has a very important role to play in supporting daily activities for people, from households to industries.

At present the weather and climate information services in Indonesia are managed by the Meteorology and Geophysics Agency (BMKG), which is a government institution that has the obligation of carrying out tasks in the fields of meteorology, climatology, air quality and geophysics. One of the tasks carried out by BMKG is conducting observations of weather and climate in all regions of Indonesia. Weather observation data is very important due to its role as the input of weather forecast information. Precise observation data and with the distribution of a dense observation point will also produce good weather information products. However, currently the weather observation points owned by BMKG have not been spread evenly and dense enough.

To improve the quality and quantity of weather observation data in Indonesia, it is necessary to add the weather observation network (Fakhruddin et al., 2019; Jaffrés, Cuff, Rasmussen, & Hesson, 2018; Yamanaka, 2016). However, given the limited resources that BMKG has in continuing to increase its weather observation network, various efforts are needed to increase the density of the observation network, one of which is to build partnerships with other parties, both government agencies and the general public (Ashaye & Irani, 2019; Holland, 2019; Porumbescu, 2016; Twizeyimana & Andersson, 2019; Zhao & Fan, 2018).

One of the partnerships in weather observation that has been carried out by BMKG is manual rainfall observation in various rainy posts distributed throughout Indonesia, including in South Sulawesi Province. Currently in South Sulawesi there are 257 rain posts. In general, this rainfall post is located in the office of BMKG partner agencies such as the Office of Agriculture, Seed Centers and so on. When viewed from the spatial distribution, the network of rain posts in South Sulawesi is also not quite evenly spread. With an area of around 46,717.48 km2, it can be said that 1 (one) rain post represents an area of around 182 km^2.

At present the partnership model built between BMKG and the land-owning agency is in terms of the provision of equipment by BMKG and the provision of land by the relevant agencies and the observation process by the community around the rain post which is given the task of making observations. However, this partnership model has not clearly described the benefits that can be taken by each party and the opportunities for development that can be done. This study tries to find out the recognition of the existential partnership model between BMKG, related agencies and observer communities and try to find the development of an ideal partnership model in observing this rainfall. This article aims to: Improve the quality of weather and climate information services; 2) Increase community participation in weather observations.

LITERATURE REVIEW

Partnership Theory

The term partnership has a very broad scope both in terms of concept and application. There are various assumptions that underline the definition of the partnership itself. First, opportunities for synergy in various forms, resulting in an understanding that the results of joining will be greater than separated. Second, partnerships involve elements including the development and implementation of strategies or a set of projects/operations, although each party may not have the same level of involvement at each stage (Ahmad, Dirawan, Akib, Kahar, & Malik, 2015; Husain, Akib, Gani, & Guntur, 2018; Mappasere, Imbaruddin, & Akib, 2014; Smith & Akib, 2015). Third, in public and private partnerships, the public sector is not only pursuing commercial goals. Therefore the criteria of the partnership can also be interpreted as the existence of social partnerships (McQuaid, 2002).

From the perspective of economic development, the partnership is a scheme with involvement or funding from more than one institution (Sellgren, 1990). Whereas (Bennett & Krebs, 1994) emphasizes the same thing, namely the existence of shared objectives of several institutions and defining partnerships as cooperation agreements between several actors to work together to achieve the economic goals that have been determined together. Until now there has been a lot of developing definitions of partnerships taking into account the policy perspective. One definition of a partnership is a collaboration between business people, non-profit organizations and governments where all risks, resources and capabilities are shared in a project which can ultimately bring benefits to the parties involved and also to the community (Stratton, 1989).

From the perspective of national development in Indonesia, partnerships in development contain the essence of justice in the acquisition of benefits and benefits, the imposition of costs and the handling of risks that arise in such business activities

(Linder, 1999). Thus, the partnership developed is an equal partnership between actors by their contribution capabilities.

Although not required by law, partners may benefit from a partnership agreement that defines the important terms of the relationship between them. (Andrews & Entwistle, 2010; Chen, Chen, Vertinsky, Yumagulova, & Park, 2013; Day, 2004; McQuaid, 1999). Partnership agreements can be formed in the following areas:

1. Business: two or more companies join forces in a joint venture (Bamford, Ernst, & Fubini, 2004; Luftman, 2004; Tuten & Urban, 2001) or a consortium to i) work on a project (e.g. industrial or research project) which would be too heavy or too risky for a single entity, ii) join forces to have a stronger position on the market, iii) comply with specific regulation (e.g. in some emerging countries, foreigners can only invest in the form of partnerships with local entrepreneurs (Coispeau & Luo, 2015; Luftman, 2004; Tuten & Urban, 2001). In this case, the alliance may be structured in a process comparable to a Mergers & Acquisitions transaction.
2. Politics (or geopolitics): In what is usually called an alliance, governments may partner to achieve their national interests, sometimes against allied governments holding contrary interests, as occurred during World War II and the Cold War.
3. Knowledge: In education, accrediting agencies increasingly evaluate schools, or universities, by the level and quality of their partnerships with local or international peers and a variety of other entities across societal sectors.
4. Individual: Some partnerships occur at personal levels, such as when two or more individuals agree to domicile together, while other partnerships are not only personal, but private, known only to the involved parties.

Partnerships present the involved parties with complex negotiation and special challenges that must be navigated unto agreement. Overarching goals, levels of give-and-take, areas of responsibility, lines of authority and succession, how success is evaluated and distributed, and often a variety of other factors must all be negotiated. Once the agreement is reached, the partnership is typically enforceable by civil law, especially if well documented. Partners who wish to make their agreement affirmatively explicit and enforceable typically draw up Articles of Partnership. Trust and pragmatism are also essential as it cannot be expected that everything can be written in the initial partnership agreement, therefore quality governance (Zadek & Radovich, 2006) and clear communication are critical success factors in the long run. It is common for information about formally partnered entities to be made public, such as through a press release, a newspaper ad, or public records laws.

Partnership Models

In building partnerships there are 5 (five) main dimensions that need to be considered, namely: a) What you want to achieve from the partnership, b) Who is involved, c) When is the implementation, including phasing, d) Where the partnership will be carried out, and e) How this partnership will be carried out. Referring to the theory above, we can identify early partnership models based on these five dimensions.

In this study, the author will begin the identification of the partnership model by referring to the second dimension, namely who is involved or the actors in the partnership. By identifying the actors involved, the partnership models can be categorized into:

Two-party Partnership Model. The two-party partnership model includes public-private partnerships, public-community partnerships, government partnerships with professionals, such as academics, researchers, engineers and so on (the Public Professional Partnership).

Multiple Parties Partnership Model. As the name suggests, the partnership model of multiple parties is carried out by more than 2 (two) parties. The forms of partnership models of many parties are very varied, for example, among others, Public-Private Professional Partnerships, Government-Private Partnerships, Professional and Community Partnerships. Variations in partnership models, both two-party partnerships and multi-party partnerships are very diverse, this can be determined by 4 (four) other partnership dimensions of the partnership mentioned above.

National Policy in the Field of Meteorology, Climatology, and Geophysics

The legal basis of national policy in the field of weather and climate information services is listed in Regulations No.31 of 2009 concerning Meteorology, Climatology and Geophysics. It was stated that the government in this case the Meteorology, Climatology and Geophysics Agency (BMKG) must provide meteorological, climatological and geophysical services, which include weather and climate information services (Undang-Undang Republik Indonesia, 2009). And in the Act it is also stipulated that the services provided must meet standards, both national and international standards.

As a derivative of this regulation, the following rules have been produced which organize weather and climate information services, both government regulations, in this case the Meteorological Climatology and Geophysical Services as well as the rules below, namely the rules of the Head of the Meteorology and Geophysics Agency (Peraturan Pemerintah Nomor 11, 2016).

In carrying out its duties and functions, the Meteorology, Climatology and Geophysics Agency as a weather and climate information service provider has 3 (three) components, namely: 1) Component of technical infrastructure, which includes Observation Networks, Equipment, Calibration, IT Systems, Software, Office Buildings, System Integration, Communication and Maintenance Networks. 2) Production Components, including observation, processing and data analysis, forecasting, supervision. 3) Service component that handles weather services in various fields, both scheduled (routine) and early warning information (Early Warning). Of the three components above, it can also be said that the Components of Technical Infrastructure and Production Components are included in the Back Office component group and the Service Component is a Front Office component group.

Global Observing Networks

Management of global observation networks is currently regulated by the World Meteorological Organization (WMO) in a program called the Global Observing System (GOS). GOS aims to provide quality weather observations both from land, sea level and from space, which will then be used for making weather analysis and forecasting and other related applications (Menne, Durre, Vose, Gleason, & Houston, 2012).

In general, GOS consists of 2 (two) sub-systems of observation, namely surface-based observation and space-based observation. Earth-surface based observations can consist of synoptic observation stations both land, sea, and upper air, climate observation stations, agricultural meteorological stations, aviation meteorological stations and special meteorological stations. Ground weather observation stations (land synoptic stations) can be either manned station or unmanned station.

In making observations, all observation stations must be equipped with standardized observation equipment and are routinely calibrated, so that the resulting data is suitable for further use.

Overview of Rainfall Observation Posts in South Sulawesi

At present, the rain gauge network in South Sulawesi covers 257 posts as shown in Figure 1), including MKG stations and collaborative rain posts. At rain stations/posts in South Sulawesi, routine rainfall measurements are carried out every day at 07.00. The rainfall data from the measurement results are then recorded and then reported to the Maros Climatology Station, which is the coordinating station for South Sulawesi Province.

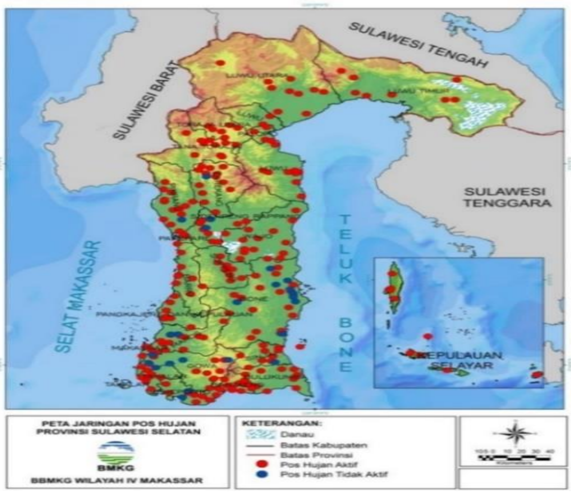

Figure 1. Map of the network of rainfall observation posts in South Sulawesi

RESEARCH METHODS

This type of research is qualitative research where in addition to the description process of the theory and data, there is also an analysis of the data obtained. Qualitative analysis is mainly carried out at the operational level of theory, which is analyzing survey data about partnership models and variables.

Research Variables and Operational Definition. Partnership Variables and determinant variables:

1. Partnerships in the development of weather and climate observation networks are partnerships between the Meteorology, Climatology and Geophysics Agency as the government and other government agencies and the public.
2. An existing partnership is a partnership carried out by the BMKG with its stakeholders and stated in the collaboration text that is still valid. A total of 166 collaborative texts will be analyzed in this study.
3. Other government agencies are government agencies in the South Sulawesi region that are BMKG partners to place manual rain gauges so that they act as rain observation posts.
4. An ideal partnership model is a form or model of partnership in the field of weather and climate observation network management which is considered the most suitable to be applied in Indonesia.
5. The research area is the province of South Sulawesi with its object being a rain observation post in South Sulawesi.
6. Determinant variables are factors that influence the implementation of partnerships, namely guidance and incentive factors.
7. The Observer Group is a group of observers of rainfall. This observer group is divided into 2 (two) groups, namely, general observer groups, namely observer groups that are not yet equipped with application-based observation data technology facilities. This general group consists of 251 observers. While the second group, namely the special group, is a group of observers who have been equipped with technological facilities for sending observational data. This special group numbered 32 observers.

Research Period. Pre Observation Period, conducted for 1 (one) month, namely in March 2018. The activities carried out include: a) Determining the location of rain observation posts which will be facilitated with data transmission applications; b) Making data sending application; c) Preparation of survey questions – observation Period, conducted for 6 (six) months, starting from April to September 2018. The activities carried out include: a) Distribution application for observers who get guidance; b) Online training for sending data using the application; c) Period of observation. Post Observation Period, conducted for 1 (one) month which includes activities: a) Recap of observation data. Data from the observations that have been entered will be recapitulated to find out the consistency of observation and data transmission; b) Continuity observation survey. It is done to observers to find out whether they are willing to continue observing for a longer period; c) Analysis of observation data. They have performed to determine the consistency of frequency of observation and data transmission. From this consistency analysis it is expected that conclusions can be drawn while what kind of partnership model has a high level of consistency.

Objectives and Research Respondents. The research objectives are three parties, namely BMKG, other Government Agencies as land providers and the community as observers. The respondents from this study were observers who routinely observed rainfall.

Data collection technique. Motivation and sustainability variable data were obtained through a survey conducted on 28 respondents who were observers. The survey was conducted online for 6 (six) months, namely between April - September 2018. Variable data on partnership consistency is obtained through analysis of rainfall observation data. Observation of rainfall is carried out through 2 (two) methods, namely: a) Manual observation with manual data delivery and 2) Manual observation with automatic data sending. The display of the application of automatic observation data can be seen in Appendix 6.

*Determinant Variables***.** Incentive variable data obtained through surveys conducted on 27 respondents who were observers. The survey was conducted online for 6 (six) months, namely between April - September 2018. I am coaching variable data obtained through analysis of observational data. Observation of rainfall is carried out through 2 (two) methods, namely: a) Facilitation of technology, which is sending observational data using an automated data transmission system application via cell-phone; b) on facilitation of technology, namely sending data from observations manually via SMS.

Data Analysis Technique. Variable Motivation for Partnership and Sustainability of Partnerships. The data used is survey data online. Where this survey contains several aspects, namely motivation, benefits, participation and sustainability, some of the questions asked include motivation to be a weather observer, respondents 'opinions about the importance of observing the weather, whether the respondent uses weather data for the agency's operational needs or research, as well as the respondents' willingness to be self-reliant and voluntary weather observers.

Consistency Variation of Partnership Implementation. The data used in this analysis are monitoring rainfall monitoring data, both those using technological facilities and non-technological facilitation. The consistency index of partnership implementation is calculated based on Table 1) below.

Table 1. Consistency Index Determination

No.	Percentage of Data Delivery	Consistency Index
1	0 – 25 % Data delivered on time	1 (Inconsistent)
2	26% - 50% Data delivered on time	2 (Less Consistent)
3	51% - 75% Data delivered on time	3 (Consistent)
4	76% - 100% Data delivered on time	4 (Very Consistent)

*Determinant Variable Data Analysis***.** Coaching Variable, the data used are rainfall observation monitoring data for period April to September 2018, both for rain posts that use technological facilities and non-technology facilities. The incentive variable was analyzed using data obtained from survey data.

RESULT AND DISCUSSION

Partnership Variable Data Analysis

The partnership variable data consists of 3 (three) aspects, namely Motivation, Sustainability, and Consistency.

Motivational Aspects. This aspect is obtained from the analysis of survey results. Where based on the results of the survey it is known that as many as 50% of respondents stated their motivation to be weather observers was because they felt interested in learning the weather, 25% due to work obligations, 18% due to duties from superiors, and 7% due to additional income earned. Most of the respondents received information about rain observation directly from BMKG (50%), the rest varied from the head of the agency where the respondent worked, and colleagues in their respective offices. All respondents (100%) said that they had received monthly incentives as observers of rainfall, and most respondents (68%) stated that they were still willing to carry out observations even though these incentives were eliminated. The results of the analysis of this aspect can be concluded to be quite satisfactory, so that it can be said that additional income is not the main reason for observers to partner.

Sustainability aspects. Analysis of this aspect was also obtained from survey data. As many as 64% of respondents stated that they were late in sending data from observation less than three times per month. While 25% of respondents stated that they were never late in sending observational data, and another 11% stated that it was quite often late to send rainfall data. 64% of respondents said they were willing to become rain observers if the BMKG wanted to add the number of raindrops in the respondent's area, but if there were no incentives as much as 54% of respondents said they were not willing to become observers. Likewise when asked for self-help buy a rain gauge and without incentives, as many as 86% of respondents said they were not willing.

Based on the analysis of the results of this survey, it was concluded that the current sustainability aspects in the BMKG partnership are still not ideal enough, where there are still several factors that must be fulfilled so that this partnership can continue in the future, including the existence of incentives and provision of measuring devices rain if BMKG wants to increase the number of rain observation posts.

Consistency aspects. This consistency aspect is obtained from the analysis of monitoring data on rainfall monitoring, both for rain posts which have been equipped with technological facilities (data transmission using applications), and rain posts that have not been equipped with technological facilities (manual data transmission). This consistency aspect is divided into two components, namely the component of consistency in the amount of data entered and the component of consistency in the timely delivery of rainfall data.

Based on the components of consistency in the amount of rainfall data that comes in, the rain post equipped with application-based rainfall data transmission technology facilities shows the percentage of incoming data that is larger than the rain post that has not been equipped with this application. The percentage value of the data entered for raindrops with technology is in the range of 87% - 98%, while the non-technology raindrops have a lower percentage, which is in the range of 83% - 90%. However, if it is converted into the Consistency Index value, the value of the component consistency in the amount of data entered for these two types of rainfall posts is still in the same category, which is Very Consistent.

Whereas when viewed from the components of consistency in the timeliness of sending data from rainfall observations, these two types of rainfall posts show a much different percentage value. At the rain post that has been equipped with technological facilities, the percentage of the timeliness of data delivery is in the range of 83% -90% while in the non-technology rainy post it is in the range of 44% - 49%. So that the Consistency Index for technology raindrops falls into the Very Consistent category, while the non-tech rainfall posts fall into the category of Less Consistent. From this analysis, it can be concluded that the element of coaching is very influential on the consistency of the partnership.

Determinant Variable Data Analysis. This determinant variable consists of two aspects, namely the aspect of incentives and aspects of coaching. Incentive aspects are obtained from the analysis of survey results data, while guidance aspects are reviewed from the results of monitoring rainfall data.

Based on the results of the survey, the existing BMKG partnership currently has 100% incentives for its partners, meaning that every month there is an honorarium given to weather observers. And as many as 68% of respondents said they were willing to continue their role as weather observers even though the incentives were stopped. However, if the BMKG wants to add new rainfall posts and without incentives as much as 54% of respondents said they were not willing. So it can be concluded that the incentive aspect plays an important role in the BMKG partnership, where this aspect must exist if the BMKG wants to add the number of new observation rain posts.

While for the guidance aspect, it is viewed from the difference in the performance of the two types of rain posts, namely the rain post which has been equipped with technological facilities, and non-technology rain posts. Where the results of monitoring rainfall observation data from these two posts show significantly different results for the timeliness component of data transmission, where the technology rain heading falls into the category of Very Consistent while the non-technology rain heading falls into the category of Less Consistent, so that it can be concluded that in the aspect of guidance, the rain post that has been equipped with the application of automatic observation data has a better performance in terms of the amount of incoming data and the timeliness of data delivery compared to the rain post that has not been equipped with the application of observation data.

Table 2 below shows the value of the consistency percentage of partnerships for general groups (rain posts without technology facilities) and special groups (rain posts with technology facilities).

Table 2. Partnership Consistency Percentage

No.	Observer Group	Consistency (%)	Addition
1	General	65.9%	No Guidance
2	Special	91.3%	With Guidance (Technology Facilities and Monitoring)

CONCLUSION

Based on the analysis and study described in the previous chapters, several points can be taken as follows:

Based on the partnership variable analysis, the existing BMKG partnership in carrying out weather observations shows satisfactory results in the aspect of Motivation. While the aspects of Sustainability still show unsatisfactory results. Whereas for the Consistency aspect it shows very consistent results for rain posts that have been equipped with technological facilities, both in the component number of incoming data and the timeliness of data delivery. Different results are shown by non-technological rainfall posts, where the consistency of the amount of incoming data is classified as Very Consistent while the accuracy of data delivery is still classified as Less Consistent.

Based on the analysis of the influence variables, the results obtained that the aspect of incentives is one of the motivations for most partners while the guidance aspect shows that the rain post that has been equipped with technological facilities has a performance of consistency in terms of the amount of data entry and delivery timeliness that is higher than the performance of non-technological rain posts.

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